

Physiology labs for blood (6)

RBC indices & Blood grouping



المجموعة السابعة

دفعته 33 طب بشري

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تلخيص /



1st RBC indices: Red blood cell indices are blood tests that provide information about the hemoglobin content and size of red blood cells. they can be calculated from the 3 tests that are used to measure the RBCs **Hb estimation, RBC count, and PCV.**

I. Mean Corpuscular Volume (MCV) "red cell size"

The MCV is the average or mean volume of a single red blood cell, it is calculated from the following formula $\frac{PCV}{RBC\ count}$

- if the cells are **smaller** than normal , the condition is called **microcytic anemia** , it is due to
 - 1- **iron deficiency** if the ferritin level is low
 - 2- **thalassemia** if the ferritin level is normal
- if the cells are **bigger** than normal , the condition is called **macrocytic anemia** , it is due to
 - 1-**folate deficiency**
 - 2- **vitamin B12 deficiency**
 - 3- **alcoholism**
- if the cells are **normal** the condition is called **normocytic** ,the anemia is due to **blood loss**

II. Mean Corpuscular Hemoglobin (MCH)

The MCH is the average hemoglobin content in a single red blood cell , It is calculated from the following Formula $\frac{HB \times 10}{RBCs\ count}$

III. Mean Corpuscular Hemoglobin Concentration (MCHC)

The MCHC represents the relationship between the red cell volume and its percentage of the saturation with hemoglobin, that is, how much of the red cell are occupied by Hb

MCHC is calculated from the following formula $\frac{Hb\ in\ gram\ per\ ml\ blood}{PCV\ per\ ml\ blood} \times 100$

For example

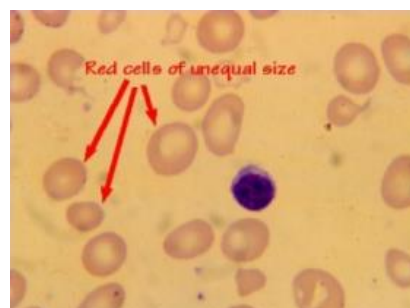
Hb = 15 g%, PCV = 45%

$MCHC = \frac{15}{45} \times 100 = 33.3\ percent$

Normal range = 30–36%

IV. red cell distribution width (RDW)

Measures the RBC size variation



2nd blood grouping (blood typing)

- Blood Group Systems

There are at least 30 commonly occurring antigens that have been found on the surfaces of human red cell membranes. Of different blood group systems, only two are of great clinical importance. These are the **ABO system** and the **Rh system (-,+)**. Other blood group systems are: Duffy, Kid, EE, etc.

- we must do cross match test to donor blood and recipient blood, because some time agglutination occurs even if both have same blood type(ex B+), in this case agglutination occurs due to the other blood group systems . cross match test is done at 37° same as body temperature

- Materials needed for this test :

1- blood : either from **EDTA** or **form capillary blood** , capillary blood coagulate fast so we have to work fast and make sure the blood didn't form a clot

2- reagent : there are four reagent

-anti A reagent : blue ,contain anti A antibodies

-anti B reagent : yellow, contain anti B antibodies

-anti AB reagent : colorless, contain both antibodies, it is not always used.

-anti D reagent : colorless , used for **Rh system (-,+)**.

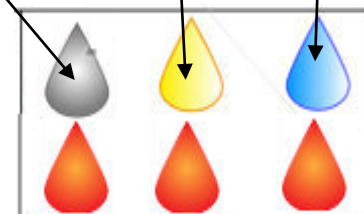
3- glass slide : it must be very clean

-steps :

1- first put 3 drops of the anti A ,B, and D reagents on side of the slide.

2- then put 3 drops of blood in the other side of the slide.

3- mix each blood drop with its corresponding reagent drop , mix by a lancet or a capillary tube , wipe the lancet or break the head of the capillary tube after mixing each drop to prevent mixing of the different reagents



- HOW TO READ YOUR RESULTS :

* anti A & anti B reagents takes $\frac{1}{2}$ minute

* anti D reagent takes 1 – 1 $\frac{1}{2}$ minute , if agglutination occur it is **Rh +** , if agglutination didn't occur it is **Rh -**

quiz : what are the types of the of the following samples ?



ANTI-D ANTI-B ANTI-A

The solution "upside down"

1 Rh+ B 2 Rh- O 3 Rh- A

BLOOD TYPE	ANTI-D	ANTI-B	ANTI-A
O-POSITIVE	Agglutination	No agglutination	No agglutination
O-NEGATIVE	No agglutination	No agglutination	No agglutination
A-POSITIVE	Agglutination	No agglutination	Agglutination
A-NEGATIVE	No agglutination	No agglutination	Agglutination
B-POSITIVE	Agglutination	Agglutination	No agglutination
B-NEGATIVE	No agglutination	Agglutination	No agglutination
AB-POSITIVE	Agglutination	Agglutination	Agglutination
AB-NEGATIVE	No agglutination	Agglutination	Agglutination